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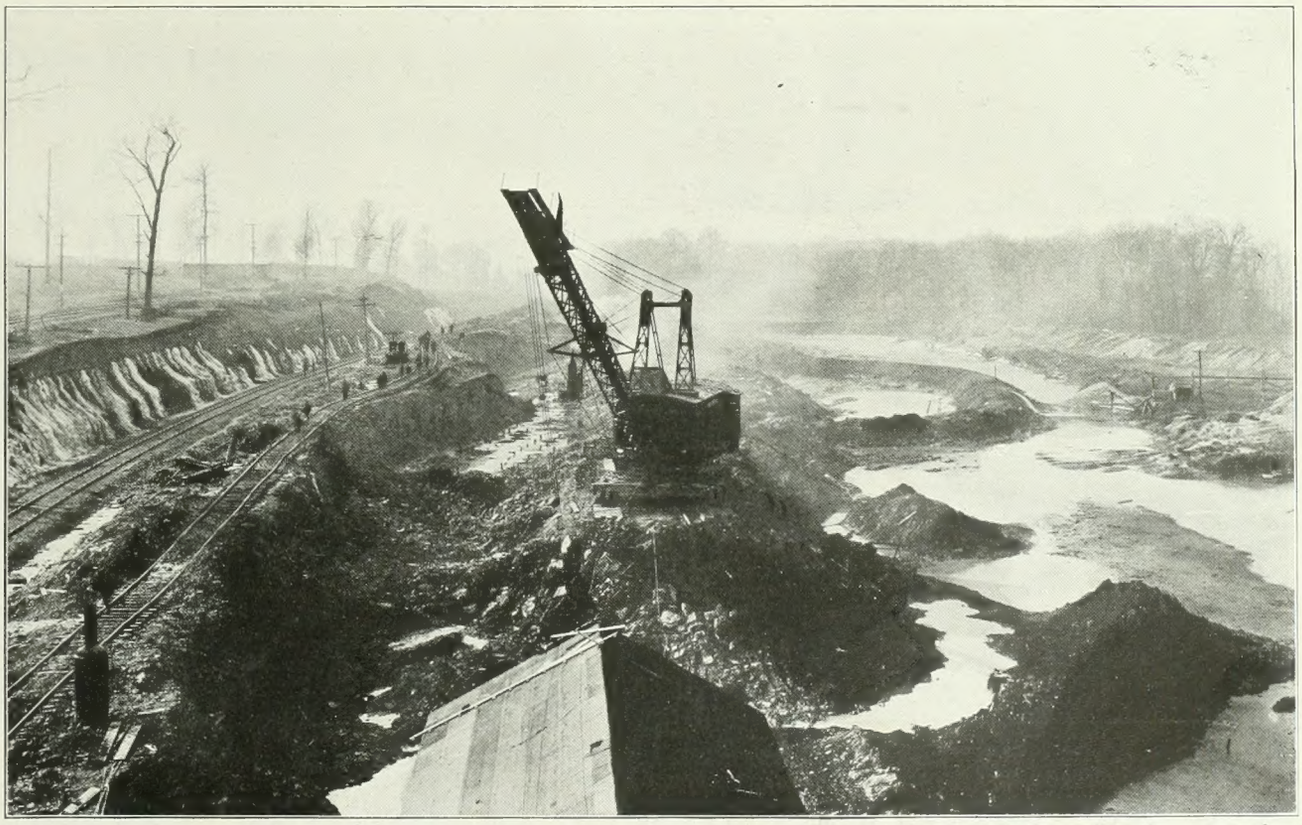
THE MIAMI CONSERVANCY BULLETIN

FEBRUARY 1919



EXCAVATING FOR OUTLET CHANNEL, HUFFMAN DAM, JAN. 16, 1919. SEE PAGE 108.

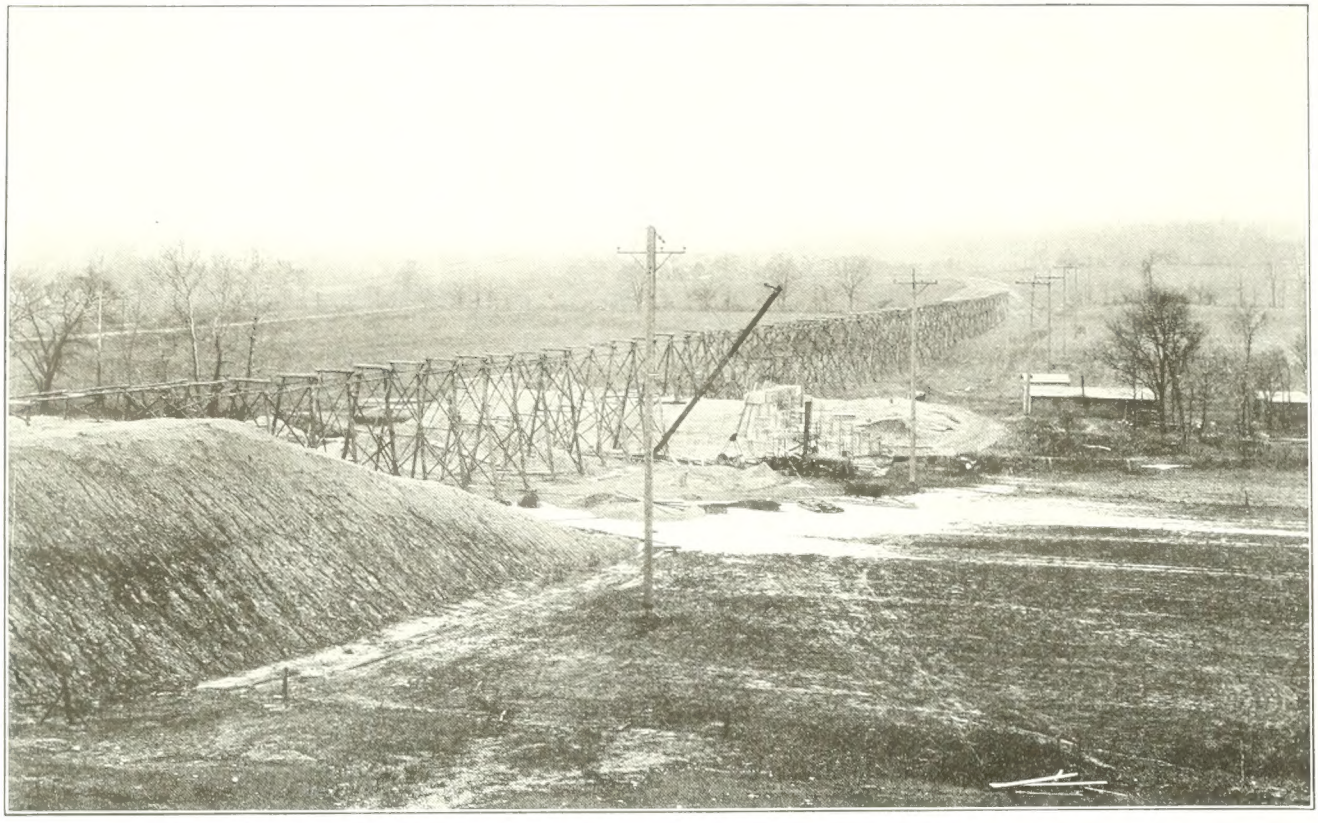


FIG. 88—CONSTRUCTION TRESTLE FOR THE FILL AT PICAYUNE CREEK, B. & O. R. R., JAN. 15, 1919

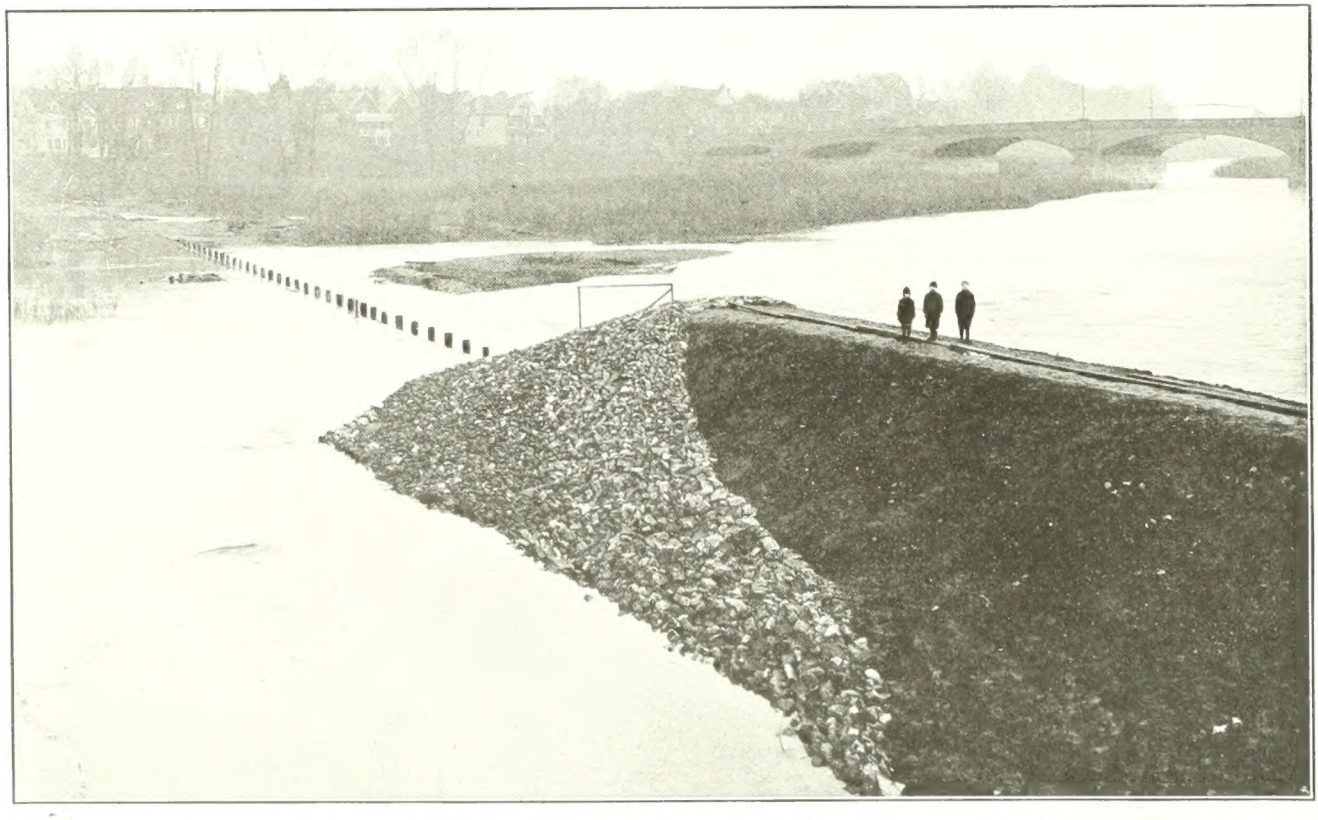


FIG. 89—SUNSET AVENUE DAM, DAYTON, DEC. 11, 1918.

The embankment to be seen at the right will become a part of the permanent levee. The blanket of stone "rip-rap" is to prevent wash by the river. The row of piles extends across the stream. It is faced most of the way with 2-inch planking on the upstream side, and braced by a second row of piles, and has a plank apron. The dam is built to raise the water in the Miami River sufficiently to float the scows which will transport the material excavated to make the deepened and improved new channel. This material will be used to build levees further upstream. Such a temporary dam should not be built in the same costly manner as a permanent structure. It is better and cheaper to run the risk of losing a section of the dam now and then by high water, and to replace the washed out section.

THE

MIAMI CONSERVANCY BULLETIN

PUBLISHED BY THE MIAMI CONSERVANCY DISTRICT

DAYTON, OHIO

Volume 1 | February 1919 | Number 7

Index

Subscription to the Bulletin is 50 cents per year. At news stands 5 cents per copy. Business letters should be sent to L. F. Wilcock, Assistant Engineer, Miami Conservancy District, Dayton, Ohio. Matter for publication should be sent to G. L. Teeple, Miami Conservancy District, Dayton, Ohio.

Bonds for $5,000,000 Sold

The Board of Directors has just disposed of another five million dollars of The Miami Conservancy District bonds. These bonds, which are in denominations of $1000 each, were sold at $103.898, which is a very fair premium.

This is part of the original issue of December 1, 1917, and there still remains an additional allotment which will not be sold until further financing is necessary. The bonds were disposed of to the syndicate that bought the $10,000,000 first put on the market, consisting of The National City Company, The Guaranty Trust Company, and Harris, Forbes and Company, all of New York. They report that the bonds were re-sold to investors within an hour after subscriptions were opened.

The Miami Conservancy District's credit is excellent. Its bonds enjoy as favorable a reputation as any municipals, and are very widely held by investors in all parts of the country.

Winter Concrete

In view of popular exaggeration of the difficulties involved in the carrying on of concrete work during the winter season, we are glad to print the article on that subject on page 105. There can be no doubt, considering the importance of pushing the work of flood prevention, that the moderate additional expense of winter concreting as carried on at the various damsites where concrete work has been started, is a matter of small moment relative to the advantages gained. Also there is little doubt that with the vigilant care exercised in protecting it, the concrete will be as sound as any. On important structures, where time is a consideration, winter concreting has become a standardized operation, the results of which, with due care, are well assured.

The Conservancy Farm and Forest Lands

A great project like that of flood prevention in the Miami Valley has many aspects and presents many problems. Among them is the farm land problem. In the five retarding basins of the District lie several hundred farms, comprising tens of thousands of acres, which the District has been compelled to buy outright or to acquire the right to control.

The Bulletin is planning to publish several articles on the various questions relating to these farm lands. The first, published in the present issue, relates to the disposition of the forest lands, and of the timber growing upon them. It is written by J. W. Calland, Secretary of the Ohio Forestry Association, formerly with the United States Forestry Service on reforestation projects in Colorado. Since 1913 he has been with the Ohio Forestry Department as assistant forester in charge of utilization and marketing studies in the state. He has been granted leave of absence by the Ohio Forestry Department in order that he may act as forester for the District. We believe the article will be of timely value, not only to the general public, but especially to the farmers of the Miami Valley.

A brief introduction to the articles on the Conservancy farm land policy, including the forestry problem referred to, precedes Mr. Calland's paper. It is written by Mr. Graham Smith, who has all the Conservancy farm lands in charge.

What is an Engineer?

We are glad to quote the following taken from a circular sent us by the U. S. Employment Service, Division of Engineering.

"Very interesting, as one of the by-products of the war, is a new definition of the engineer which has been written by A. H. Krom, Director of Engineering, United States Employment Service, Chicago. The definition comes as the result of the many queries that have originated through a confusion of engineering terms and standards now in general use. After serious study and consultation with eminent authorities, Mr Krom prepared the following definition:

"'An engineer is one who economically directs man power and, by scientific design, utilizes the forces and materials of nature for the benefit of mankind.'

"In writing this definition, Mr. Krom hopes to offer a practical, workable statement that will be of real value to technical men, and to employers of technical men. The definition will doubtless be useful in clarifying popular misconceptions. Students of engineering and prominent scientific authorities declare that Mr. Krom's definition is representative of the highest engineering ideals and that it covers all classes of engineering."

In view of the great and growing importance of the engineer in the world of today, this definition should be valuable, not only to technical men, but to the public also.

Death of W. R. Mounts

To his friends of the Conservancy District, the news of the death in France of W. R. Mounts, formerly of the Conservancy Engineering Staff, brought a sense of unusually keen regret. He had been in the employ of the District since 1916, so that he was well known. He had gone to Lockington as Office Engineer a year ago last March, whence he was called to the Army in July, in company with H. W. Wesie. They went together to Camp Jackson, South Carolina, and by what seemed to Mounts to be great good fortune, he was sent overseas within three weeks. The last word received from him by his friends of the Conservancy was a letter written on board ship on his way over. Then, after a long interval of silence, lasting two months or more, came the news of his death in a French hospital of cerebro-spinal meningitis, on October 26.

Mr. Mounts was a native of Blanchester, Ohio. He was a student in Civil Engineering at the Ohio State University, and came to the Conservancy in May of 1916. He was married on June 2, 1917, to Miss Helen O'Connor, of Blanchester. His wife, when he left for the Army, engaged in teaching at Batavia, Ohio, in which work she was still occupied at the time of his death. He was a young man who naturally made warm friends, and his early death leaves a gap which is deeply felt.

Appeals Against Appraisals for Benefits and Damages

Under the Conservancy law, the lands in the various retarding basins and along the rivers, affected by the flood protection plans, have been appraised as to the amount of damage or of benefit received. The law provides for appeal to the several county courts against the judgment of the board making the appraisal. There are of course a number of these appeals taken. Recently about thirty of the Osborn appeals were heard in Greene County. The amounts fixed by the jury differed very little from those set by the official appraisers. In Warren County there are only a few cases, and these are now being heard in Lebanon. In Montgomery County also the cases are few. In Butler County there is only one. The greater part of the appeals are in Miami County. In all the counties together, there are several hundred such cases. Many have been settled by amicable adjustment. All relate only to the amounts fixed by the Board of Appraisal for damages or for benefits.

Death of C. C. Williams

Mr. C. C. Williams, the Conservancy Camp Overseer at Englewood, died at the Miami Valley Hospital on January 27, following a severe surgical operation. He had been troubled for some time with what was supposed to be appendicitis, but which the operation proved to be a very serious case of intestinal cancer.

Mr. Williams was forty-four years of age and of English birth, coming to this country about ten years ago. He was a clergyman and joined the Conservancy forces on May 1st of the present year, drawn by his interest in the welfare of working men. The burial will be in Concord Cemetery at Englewood. He leaves behind him a wife and four children of school age, to whom his associates extend heartfelt sympathy in their loss.

Heifetz

At the Heifetz recital it was the fortune of the editor to sit on the rostrum along with the other distinguished citizens who had paid a dollar a head for the privilege. We were thus enabled to get a few close-ups on the famous phenomenon. We were near enough at times to have touched him. What struck us most was the way his job bored him. He went through it—"thundering plaudits" and all—like sawing wood; as if what mainly kept him at it was the high price he got per chord. (There was, we judged, about a $4500 house, of which he probably got half.)

It set us thinking. Here was this young prince of fortune, with his marvellous gift, bored with it, and bored with the homage it brought him. He hadn't as much joy of his job as you and I have. Gold pieces rolling at him so thick he has to kick 'em out of the way, and yet not happy. For us, we would rather punch our typewriter and whistle.

Beginning with this issue, the price of the Miami Conservancy Bulletin will be reduced to 50 cents per year and 5 cents per copy. Persons who have subscribed for a year will have their subscriptions extended six months without extra charge.

The Conservancy Farm Land Policy

By S. Graham Smith

Many of the farm buildings in the retarding basins are located at such low elevations that they will be subject to submergence in times of heavy flood. They presented a problem for which there was no practicable solution without authority to remove the buildings to higher ground. This meant also a re-arrangement of the farm lands to adjust the cultivated lands to the new farmstead locations. There was no practicable way out of the difficulty but to buy the farms, so threatened with overflow, outright. Thus there has come into the possession of the District some 30,000 acres of farm land.

In the re-arrangement and re-adjustment of these lands, several broad ends were kept steadily in view. The first was that the farms must be so handled as to yield the maximum value in crops, not only after the re-arrangement, but during the period of transition; second, that the value of the re-arranged farms as an investment should suffer no injury and, if possible, be increased; third, that the re-arranged farms with their re-located and reconstructed buildings should be sold so as to get them back into the hands of private owners at as early a date as practicable.

One of the problems in the re-arrangement of the farms was that presented by the woodlots and forest lands which lie in the various basins. A hundred and twenty woodlots are scattered through the District, containing millions of feet of standing timber, ripe and ready for market, to say nothing of the young and growing timber which is not yet economically marketable. How best to handle this timber, how much and what to sell, and how much and what to keep, constituted a great problem in itself. Evidently no one but an expert in forestry was properly fitted to handle the question. The person selected for the task was J. W. Calland, the writer of the following article. A note on Mr. Calland's experience will be found in the editorial column.

The Conservancy Timber and Its Management

Timber is a Crop and Should be Treated as Such. Growing Timber is Allowed to Stand. Ripe Timber is Cut and Removed.

By J. W. Calland

There are about 120 woodlots standing in the five basins of the District. They are generally distributed throughout the basins and contain approximately six million feet of merchantable timber. The size of the woodlots varies from less than an acre to over 100 acres in the largest. While there are no virgin stands of timber left in any of the woods within the District, there are some very fine individual trees of different species in many of them. The large number of woodlots in the basins, and the problems involved in their management, made a detailed survey of all the timber in the District advisable before formulating definite plans for handling them. Such a survey was carefully made in each of the basins and from the results of these investigations a plan of management was determined upon.

The survey shows that over 80 per cent of the District's timber is oak, maple, ash, sycamore, beech and elm. The principal oaks are white, burr, chinquapin, red, black and swamp white oak. The varieties of ash include white, black, blue and green ash. The basins containing the greatest amount of timber are Huffman and Englewood; Germantown and Taylorsville rank next, and Lockington last. The per cent of the total stand of timber represented by the principal timber trees in the various basins and also for the entire District is as follows:

TABLE SHOWING RELATIVE NUMBER OF TREES OF DIFFERENT SPECIES OCCURRING IN THE VARIOUS BASINS OF THE MIAMI CONSERVANCY DISTRICT.

The figures show the number of each species expressed as a percentage of the entire tree population.

Kind	Germantown	Englewood	Lockington	Taylorsville	Huffman	Entire District
Oak	15	37	40	37	47	37
Ash	4	12	4	8	13	9
Beech	31	4	6	4	....	7
Sycamore	5	10	6	12	9	9
Elm	2	5	10	6	8	7
Hickory	5	4	4	3	7	5
Hackberry	1	3	2	4	4	3
Maple	30	15	23	14	4	14
Walnut	0	4	1	3	3	3
Basswood	2	2	1	2	2	3
Poplar	2	0	0	0	0	....
Cottonwood	0	1	2	2	1	1
Others	2	3	1	2	2	2

FIG. 90—WHAT NOT TO GROW

Forest undergrowth which will never make useful timber of any kind; hawthorn, ironwood, dogwood, etc. The larger trees should be sawed into lumber and the small brush into firewood. The occupation of this land by these "weed" trees is a loss to the owner and to the community. Taken in Huffman Basin, Jan. 7, 1919.

Timber in the farm woodlot is a farm crop. If properly cared for, a woodlot will furnish a supply of timber, posts, poles, fuel, etc., for use on the farm at all times, and also for marketing at intervals, but when it is neglected or misused the woodlot will deteriorate until the crop no longer pays. Eventually the lot is carried at a dead loss. The woodlot crop like any other must be judged by its quantity and quality. In order to produce timber of high quality the stand of trees in the woodlot must be crowded, so that the top of each individual tree may be in contact with its neighbor. The fallen dead leaves, constituting a leaf-mulch, must be maintained over the roots of the trees, and the sun and grass must be kept out. By these means trees are produced which have tall, straight trunks free from limbs and knots and with the minimum of insect injury and decay. In open, uncrowded woods just the opposite is true; the trees do not grow so high, the lower branches grow and form knots in the wood, and the trunks are much more tapering. Thus a crowded stand of trees produces not only a larger number, but a much greater proportion of high quality logs than an uncrowded woodlot of equal size. This is vitally important because the value of first quality logs is from one and one-half to two times as great as that of poor logs.

Grazing stock in the woodlot is one of the greatest causes of its deterioration. The woodlot will not serve as a pasture and grow a good crop of timber at the same time. Grass in the woodlot is a sign that the trees do not stand thick enough; the woodlot is not fully stocked, or is being mistreated. Grass will not thrive without having strong sunlight, and a woodlot in good condition permits very little sunlight to reach the forest floor. The browsing of stock will not only injure seedlings and young growth, but often destroys saplings of considerable size. The injury due to live stock in the woodlot is, however, not confined to the young trees. As a result of the destruction of the underbrush the soil is exposed to the sun and winds. These, together with the tramping of the stock, cause the ground to become hard, dry and packed, and the rain instead of being absorbed and retained for the use of the trees runs off the surface carrying with it much valuable material. Serious injury occurs to shallow-rooted species by having their roots tramped and barked. What is called "stag-headedness" in a wood, the appearance due to dead tree tops, is often the result of this form of injury. Pasturing and timber production cannot therefore be practiced on the same area except to the disadvantage of each; a combination of the two will not pay the owner as well as the practice of either one separately. It must be admitted, however, that the value of shade to stock may in some cases more than offset the loss in timber growth caused by the practice of pasturing the woods, but if shade rather than forage is the object in pasturing the woodlot, it can usually be provided by allowing the stock to run in only a portion of the lot, the remainder being more profitably devoted to the production of wood alone.

An important consideration is the kind of land devoted to timber. As a rule those portions of a farm less suitable for other crops are the portions which should be wooded. The timber crop is not sufficiently valuable to compete with other produce. Thin-soiled hills, steep and rocky slopes, or low, wet lands may well be planted with suitable trees. In such areas trees, if properly cared for, will pay better than any other crop. These considerations are often violated. A number of farms of the District have timber standing on valuable land, while others have cleared poor lands which should be reforested.

Attention must be given to the kinds of trees in a wood. An area properly devoted to forests may contain the wrong kinds, known as "weed trees." Figure 90 is an excellent example of this. Such trees as honey-locust, hawthorn, ironwood, wild apple, etc., produce no crop worth while, and occupy land which should grow a crop of value. On uplands and hills oak, maple, ash, elm, walnut, hickory, beech and basswood all have value; on low ground, cottonwood, Norway poplar, basswood and elm are proper varieties. The weed trees, where they occur, should be cut out and the valuable varieties substituted. In Europe, where forests have been the object of great care for many decades, weed trees are rooted out of a wood as assiduously as weeds from a garden, to prevent their propagation

with the waste thereby involved. It is a sound policy for American farmers to follow.

In applying the principles just enunciated, it is unfortunately necessary to note that a very large percentage of the woodlots of the District are so situated or have been so thinned by cutting or grazing that they can no longer be left in woods at a profit. Each lot presents its own particular problem; nevertheless, the woodlots of the District may be divided into two general types, each of which requires a different method of handling. First, woodlots which are made up largely of scattered mature trees, with little or no undergrowth, severely pastured, and in many cases occupying valuable agricultural land; and second, woodlots which are characterized by a fairly well-stocked stand of thrifty growing timber.

In the first type pasturing has continued for so long, with the better trees being culled out, that the only course left is to clear off the remaining trees, leaving only such groups as may be desired for shade or for future building sites. What makes this still more advisable is that the old trees in these stands are very likely to be deteriorating in quality. It is a fundamental principle of forestry that, from the standpoint of strict business management, timber when mature should be cut just the same as corn or hay.

Of the second type of woodlot, above referred to, we find in the District several varieties. In one case, weed trees may predominate, crowding out the better kinds. In another case, trees of proper kinds may be overcrowded to the point where they need thinning out. In still another case, so much cutting may have been done that the wood has been understocked to the point where it is not maintaining itself by reproduction. Considerable improvement may be brought about in some of these woodlots by the judicious removal of inferior material to be used for firewood, or simply as an "improvement cutting." Any such cutting must have for its object the removal of only such part of the inferior material as will not open up the woods too much for the best growth of the more desirable trees, as heretofore explained. It must be remembered also that the health and vigor of the trees is much influenced by the condition of the soil. The earth needs to be kept fresh, loose, soft, and free from grass. With field crops, this is attained by cultivation, but in the woods it must be secured by keeping the ground shaded. The leaf mulch is also an aid in this regard.

Woodlots standing in the lower ground in the various basins, particularly those at no great distance up-stream from the dams, will generally in any case be entirely cleared up, since a flood great enough to partly fill the basins with water would probably be sufficient to kill the majority of the trees in such woodlots if the water remained over them for a few days.

In addition to the woodlots now in existence, it is hoped that fresh plantings will be made in a number of localities in the District. Some of these will be undertaken at once by the Conservancy forces.

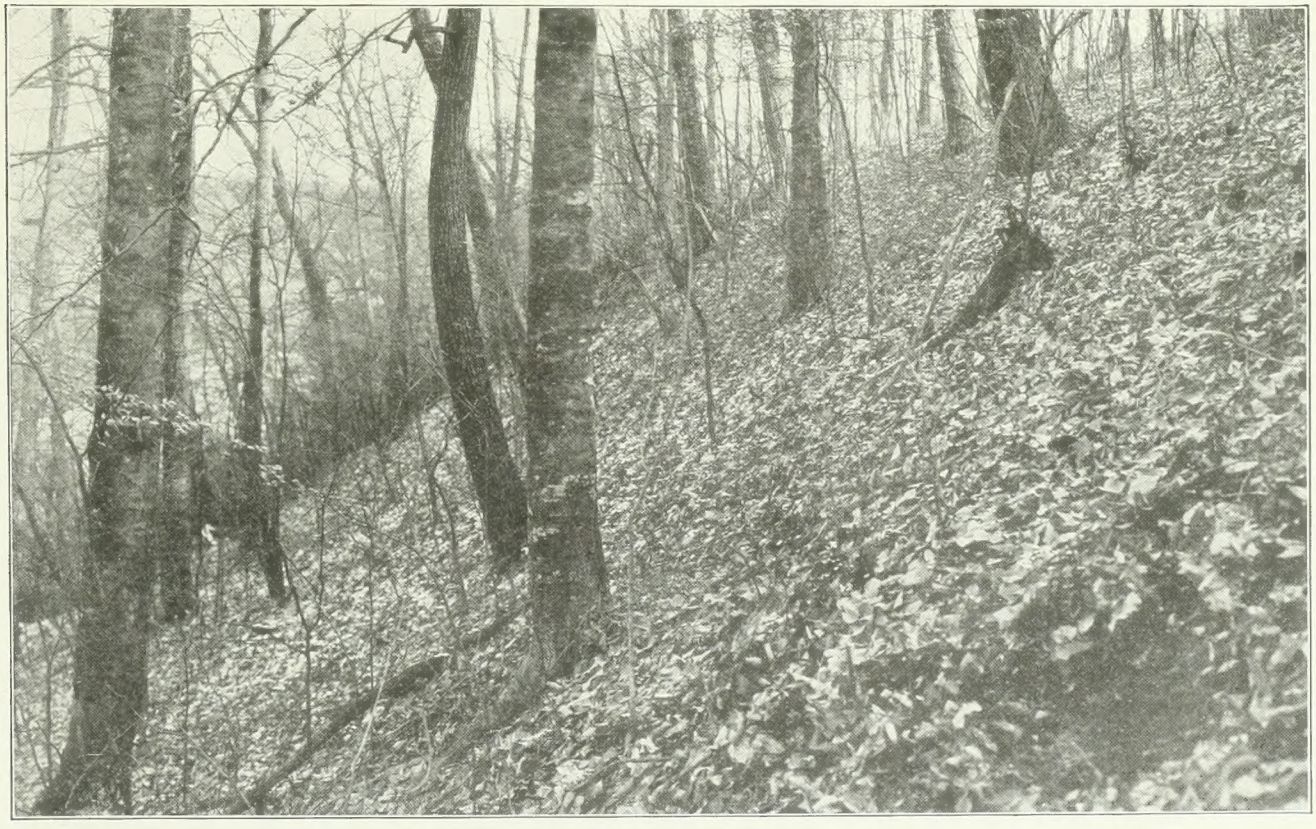


FIG. 91—THE RIGHT CROP FOR STEEP HILLSIDES

A steep hillside, such as is shown above, in most cases is more suitable for forest than for any other crop. Note complete absence of soil erosion; also, in spite of the scanty growth of timber in the foreground, the deep leaf mulch which covers the ground. Taken in Germantown Basin, Jan. 10, 1919.

These will be confined to limited areas, the species to be planted being mostly black locust or other fast-growing varieties suitable for posts. Locust groves now standing in the various basins have made a satisfactory growth and while some injury has been suffered from insect attacks, the general condition of these plantations is encouraging. Several thousand posts will be cut from them during the present winter. A great number of fence posts will always be needed in the basins, and the indications are that locust groves, if properly located and cared for, will prove to be quite profitable.

We have heretofore considered only the commercial aspects of the question, but there are other considerations. In some cases it may prove advisable to plant groups or groves of suitable trees for windbreaks and shelterbelts to protect buildings located in exposed places, or to serve as shelter and shade for stock. Of at least equal importance is the esthetic value of trees. This is often connected with commercial considerations and will be more so as time goes on. Trees, attractively planted around a farmstead and in waste areas, unquestionably add to the value of the farm by the addition they make to its appearance. Groves of trees standing near the damsites will be left wherever practicable. Additional groups ought also to be planted where they will add to the beauty of the landscape at these points. The dams are great public works, built by the people of the Miami Valley in order that they and their descendants may dwell in peace and safety, and which will stand as monuments to the present generation for centuries to come. As such they should present to the eye a beauty and dignity commensurate with their worth. Noble trees, rightly planted as a setting in places where they harmonize with the proper use of the dams, will make a distinct contribution to this end.

In conformity with the principles which have been heretofore enunciated, the cutting of Conservancy timber has already been carried on to a considerable extent. Perhaps the most important, as it was the earliest timber to be cut, was the black walnut, due to the demand for it during war time for the manufacture of gun stocks and airplane propeller blades. An inventory showed approximately 400 walnut trees in the Huffman, Taylorsville and Englewood basins, and also a few in the Lockington basin. Representatives of various walnut concerns operating under Government contract were requested to inspect the trees and submit bids on them. The walnut in Huffman, Englewood and Taylorsville basins was eventually sold to the Steele-Aldurfer Co. of Cuyahoga Falls, Ohio, and that in the Lockington basin to the Buckeye Churn Co. of Sidney, Ohio, the highest bidders.

Following the same plan, about 130,000 feet, comprising the bulk of the white and blue ash standing in the Huffman, Taylorsville and Englewood basins, was offered for sale, and in this case the highest bid was submitted by the American Fork & Hoe Co. of Ashtabula, Ohio. This ash will be cut and shipped in the log to Ashtabula, where it will be manufactured into handles. Various other

FIG. 92—CORRECT TREE GROWTH FOR A WOODLOT

Young trees of species that will make valuable timber some day. The stand is thick enough to grow tall and straight and maintain ground covering of dead leaves so beneficial to tree growth. Mature timber will be cut and used; young trees left to grow to maturity. Taken in Huffman Basin, Jan. 7, 1919.

sales have been made of standing timber, piling, clear logs, cordwood, etc.

A very important factor in planning the disposal of the Conservancy timber was the amount of material needed by the District itself for various forms of construction work in the different basins. Some of this material was of such a nature that it could be supplied from the nearby woodlots to better advantage than by shipping it in from outside sources. Arrangements were made with the Downey Bros. at Fairfield for sawing out such lumber as was needed in the Huffman basin, and a small mill was set up near the Taylorsville damsite for sawing material needed there. More than a quarter million feet of heavy timbers, plank dimension material, and boards have been supplied for construction work in this way. Oak timbers and building material have been furnished for erecting barns, cribs and other farm buildings. Over 50,000 linear feet of piling has gone into trestles and concrete foundations. Special bills have been furnished on short notice for crossing plank, temporary ties, sheet piling for coffer dams, and timbers for boat construction. By this means several thousand dollars' worth of standing timber has been converted into material for use on the various Conservancy jobs. Care has been exercised in sawing this material, that good, clear logs are not manufactured into a cheap grade of material. Instead, the clear butt logs and some second logs have been reserved, and these will be sold in the log to companies equipped to make them into such high-grade products as veneer, quartered oak and finishing lumber.

The treetops left from logging operations, together with the crooked and defective trees, brush, etc., are not to be left scattered over the woodlots, but are being cleaned up and made into cordwood or burned so as to make the lots available for pasture and crop production. Firewood amounting to some 300 cords has already been cut from such material and is being sold.

Conservancy Concreting During the Winter

A great deal has been written on the dangers of concreting in cold weather. This has arisen largely because of failures of concrete structures due to premature removal of forms during cold weather; also, to a considerable extent, because of published tests made upon the effects of freezing weather on the setting of concrete made up into small test pieces. Upon such pieces or even upon thin sections in actual work, unless they are protected from the cold, the effects are undoubtedly bad, but practical considerations where concrete is placed in masses, like heavy walls or foundations, greatly modify these results.

Freshly deposited concrete takes a certain time for its initial set, and after this set, it continues to harden and strengthen for a long period. The effect of cold on both setting and hardening is to greatly retard them. Near the freezing point, the setting will take from four to eight times as long as at the usual temperature of a room. As the temperature is lowered this retardation increases. Below the freezing point, in small specimens, the water in the concrete may freeze before the concrete sets. In this case, no injury will result, provided alternate freezing and thawing do not occur. When the temperature rises, the water thaws, and the concrete sets and hardens as usual. After the concrete has taken its initial set, however, the remaining water, when it freezes, by its expansion dislocates the initial set and weakens the concrete.

These facts regarding concrete in small test pieces, as has been said, are greatly modified when the material is in large masses. This is due in part to the fact that the setting of concrete is a chemical com-

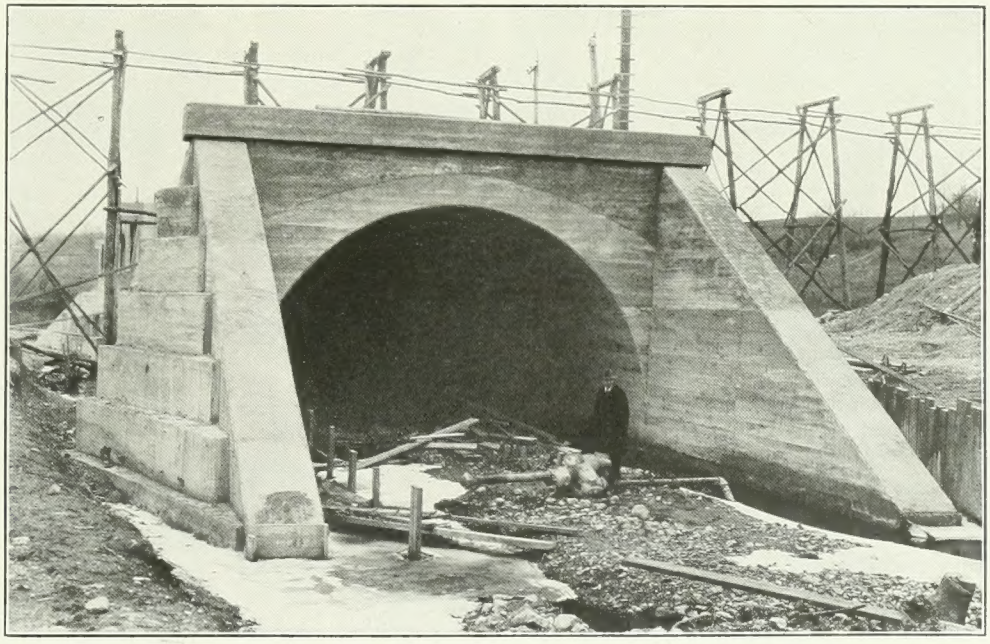


FIG. 93—BRIDGE AT PICAYUNE CREEK, B. & O. R. R.

This is a 26-foot, semi-circular, concrete arch. The barrel of the arch is 93.5 feet from end to end. The height of the fill above the bed of the stream is 40 feet, which is about 20 feet above the top of the arch. The structure contains 2300 cubic yards of concrete. The excavation was done with a clamshell and derrick. The concrete was handled by a derrick and 1-yard bucket. Piling was to have been driven under the abutments, but was found unnecessary, the subsoil being cemented gravel, and so hard that it was impossible to drive a test pile into it. Taken Jan. 15, 1919.

bination of water with the constituents of the cement, and as in most chemical combinations, the reaction produces heat. The mass of concrete will thus be raised in temperature from 20 to 40 degrees or even more, depending upon the temperature of the fresh concrete, the speed of setting, the speed of placing, the mass of the concrete, and the depth in the mass which is under consideration. As to the last, certain experiments by C. H. Paul and A. B. Mayhew at the Arrowrock Dam are significant. Electric thermometers, buried in the mass concrete of the dam, showed conclusively that with daily variations of 50 degrees in the temperature of the air, the temperature in the concrete one foot from the outside surface varied only 2 degrees, and at 3½ feet from the surface varied only one degree. The experience of hundreds of contractors in the construction of massive concrete works points in the same direction.

The effect of the rise of temperature due to setting is thus evidently to counteract to a great degree the effect of the freezing temperature of the air. The bad effects are in fact usually limited to the surfaces of the concrete on which the air directly acts, and penetrate at most to a depth not much exceeding an inch. Where the surface is allowed to freeze, portions will usually scale off, leaving a rough and unsightly surface but affecting the strength of the remaining portion not at all. To protect the surfaces in cold weather, they are usually covered with tarpaulin, straw, or similar material. In still colder weather, "salamanders" are kept burning underneath a tarpaulin or other cover. A "salamander" is simply a cylindrical stove such as may be made, perhaps of a short section of steel smoke stack, open at the top and with a grating at the bottom, in which a fire is built. A steel wheelbarrow is often used instead.

It should not be inferred, from what has been said, that there is any wish to belittle the importance of protecting exposed surfaces, where appearance and resistance to weathering, or the action of the elements, are essential. Nor should the danger of too early removal of forms in cold weather, be overlooked. These ever present dangers must always be kept in mind in order that good results may be secured in winter concreting.

A source of greater real danger to the strength of concrete placed in cold weather is no doubt the freezing of the aggregates, before they are mixed. Such frozen masses introduced into the concrete may seriously affect its strength. To prevent this, the aggregate must be freed from frost before mixing, which may be done by either salamanders or steam coils, and by heating the water.

By protecting the surfaces and heating the aggregate in the manner indicated, concrete in cold weather, with proper care, can be made as sound as any, and in any particular case, it is largely a question of expense whether the concreting will be carried on into the winter or not. Until the temperature of the air gets as low as say 25 degrees, the concreting can be continued with very little such extra care and expense. The greater part of the extra cost lies below 20 degrees. On the Conservancy work therefore, until the thermometer drops below 20 degrees, the work through the cold season will usually be continued.

On the Conservancy work, on account of its magnitude and importance, an additional factor has to be considered; that of the organized force of men who are doing the work. The method of concreting was carefully planned far in advance of its carrying out, and a skilled organization was got together to do it, with the idea of pushing the work as rapidly as possible. It is worth some expense to keep the work going in the cold weather just to keep the men together. During a considerable part of the winter, if the weather remains reasonably open, concreting can be carried on without much additional trouble. During the cold snaps, it will be shut down, and the organization kept busy on other work which has been planned for it.

Concreting has been started at three of the dams; Englewood, Germantown, and Lockington. At all of these, provision has been made for heating the aggregates by means of steam coils which were placed in the bins before winter weather set in. At all of them means are provided for protecting the surfaces from freezing by tarpaulins and salamanders, or in a few cases, by steam coils, where steam was available on account of being used for other purposes. Care is also taken that no fresh concrete is placed on frozen foundations, and that the amount of water used in mixing is properly regulated. At Englewood and Germantown, the concreting is being done in trenches which have been excavated in earth and rock. These being protected from winds by their situation, the surfaces are much more easily cared for. At Lockington, where the walls rise high into the air, this protection is more difficult, and work at Lockington is therefore held up in cold weather during a greater part of the time than at the other two places.

A consideration which makes it more advisable to push the work at Englewood and Germantown lies in the fact that more of the concreting is being done there at low points in the excavation, where water gathering and freezing might result in disintegration of the rock at the bottom, thus necessitating additional expense in cleaning up the foundation later. It is cheaper to continue concreting the low places than to go to this expense of again cleaning up.

Summarizing the above, the underlying considerations as to concreting on Conservancy work through the winter may be briefly stated thus: to keep intact the working organization so that it may drive ahead as soon as may be at full speed in the spring; and also, by the employment of the means which have been mentioned, to keep the concrete work going through the more open weather of the winter as long as it can be done without unduly increasing the expense, to the end that the whole work may be pushed as rapidly as possible.

G. E. Warburton Goes to Lockington

G. E. Warburton, who succeeds Mr. Bolton in the superintendency of the work at Lockington, was transferred from the Taylorsville Dam December 26. Mr. Warburton has been connected with the District since September 2. While at Taylorsville he erected the gravel washing and screening plant and the shop. His family will move to Lockington in the spring.

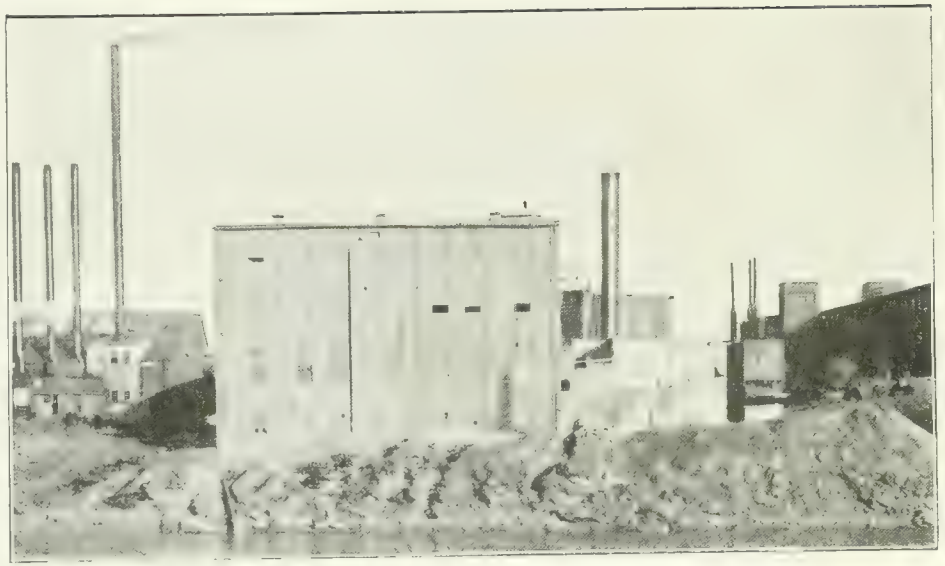


FIG. 94—STERLING PAPER MILL, HAMILTON, MARCH 28, 1918.
To the left, in Figure 94, appears also a part of the Niles Tool Works and to the right a part of the Black-Clawson Works. The central building will be entirely eliminated, together with portions of both the other plants to provide wider water-

FIG. 95—BLACKSMITH SHOP OF NILES TOOL WORKS, HAMILTON.
way for the Miami River against floods. This necessitates also partial abandonment of Black Street and Second Street in this neighborhood. The building in Figure 95 will be wrecked. Taken April 23, 1918.

FIG. 96—B. & O. CROSSING, HYDRAULIC CANAL, HAMILTON, APR. 23, 1918.
The canal was built in 1840 for water power purposes and has supplied a dozen or more industries. It is to be eliminated here on account of its interference with the flood protection plans. The water power leases have been one by one abandoned

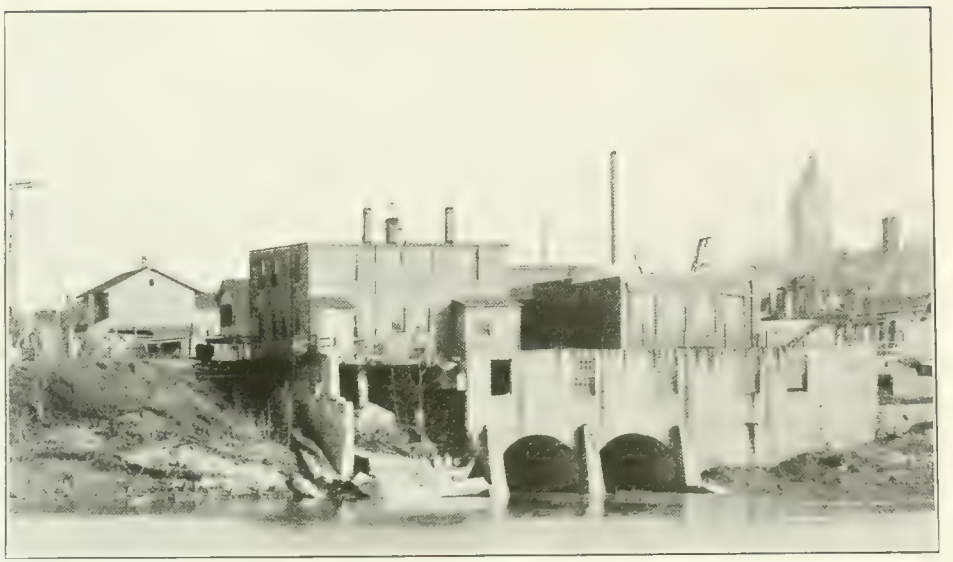


FIG. 97—HYDRAULIC POWER STATION, HAMILTON, MARCH 28, 1918.
until now the Hydraulic Company's plant, Figure 97, is the only remaining consumer of power. This hydraulic plant will be wrecked to make room for the widened Miami River.

January Progress on the Work

GERMANTOWN

The placing of concrete during the past month has been confined principally to the conduits. Seven 30-foot sections of the conduit floor, four 30-foot sections of center and side walls, and one 30-foot section of the conduit arch have been completed during the month. The pouring of arches is progressing as rapidly as practicable, this work being facilitated by the erection of a truss for moving the [illegible]. The concreting has been continued throughout the cold weather with very little experience of the usual difficulties due to freezing of the sand and gravel in the conveying apparatus.

The dragline [illegible] the excavation for [illegible] with the excavation of the inlet channel.

Clearing of the [illegible] bank of [illegible] Creek [illegible] has been started. After the dragline has finished the excavation for the inlet channel it will [illegible] clearing this bank of all stumps and removing the logs in the creek.

A [illegible] has been erected for the protection of the [illegible] engines from the cold weather.

The labor situation has improved greatly during the past month and bids fair to cause still less trouble.

There has been one death in camp during the month, that of Mrs. [illegible], wife of [illegible], who has charge of the heating plant at the mess hall. It was due to heart failure. Otherwise the health of the camp is excellent.

A. L. Pauls, Division Engineer.

January 15, 1919.

ENGLEWOOD

The continuation of the moderate weather has enabled the concreting operations to proceed with undiminished rapidity. Regular provisions are made to safeguard against any frost entering the ingredients comprising the concrete and against freezing after the concrete is in place.

On January 13 the last section of the lower sidewalls in the conduits was placed. The following day the last floor section in the outlet of the conduit was poured. Two arch sections have been finished and a second set of arch forms, to enable concreting of the arch to proceed at two places, is about finished. The sidewalls of the outlet are going ahead satisfactorily.

The large steam dragline is continuing down the east bank of the river removing gravel, top soil, and other objectionable matter from the foundation of the dam. All rock and coarse gravel are placed in the downstream toe of the dam, all other material is dumped outside the toe.

The cross dam east of the river, described in previous Bulletins, is proceeding satisfactorily. The dragline is working at present in the gravel fill comprising the downstream end of the dam.

Concrete foundations have been placed for the two 10-inch sluice pumps and for the two 15-inch dredge pumps which will convey the hydraulic fill material into the dam, and the motors have been set. Work on the pump houses is in progress. The "hog box" or bin, into which the material from the borrow pits is dumped preparatory to being pumped into the dam, is being graded to receive the timber lining.

Some [illegible] are being made to the camp roads to [illegible] certain outlying portions of the camp.

A [illegible] is being constructed to accommodate the [illegible] from the [illegible] plant at Taylorsville.

H. S. R. McCurdy, Division Engineer.

January 15, 1919.

LOCKINGTON

Favorable weather conditions during the past month have made it possible to proceed with the rock and earth excavation and concrete work without material interruption. The [illegible] to date amounts to about 90,000 [illegible]. About 17,000 cubic yards of concrete has been poured. This amount represents more than half of the concrete to be placed. Loramie Creek is [illegible] into the new channel next spring. A boiler has been set up so that steam pipes and tarpaulins may be used when necessary to protect fresh concrete from [illegible].

The revised location of the outlet channel was approved, and a permit was granted by the County Commissioners to make the necessary road and bridge alterations. The site has been cleared, and clearing is now in progress for the entrance channel above the dam. Riprap is being placed on the east slope of the outlet channel. For this purpose rock from the excavation is dumped directly from the cars which are loaded by buckets handled by the south derrick.

A test pit sunk from the floor level of the road for the hydraulic pump revealed a heavy layer of homogeneous [illegible] rock [illegible] the system of grouting holes. Grouting to this strata will insure a particularly good foundation and an effective cut-off under the concrete structure.

Price Brothers Company have completed their contract for repairs to the Port Jefferson State Dam, which will be used in connection with the Miami & Erie Canal for supplying the pumping water for placing the hydraulic earth [illegible] of the dam which was being done by the District forces, has also been completed.

The connecting link between Taylorsville Dam and Piqua will be completed January 26, enabling Lockington Dam to obtain the more reliable electric power service from Dayton over the new transmission line.

A house was recently erected over the pump for camp water supply.

There are no cases of sickness in the camp at the present time, the second wave of influenza having passed without serious results.

B. M. Jones, Division Engineer.

January 17, 1919.

TAYLORSVILLE

The Lidgerwood dragline is making good progress on the excavation for the outlet works above elevation 790. In a short time the well drills will be started drilling below this elevation.

The sluicing for the hydraulic fill was shut down December 31 in order to move the dredge pump to a new location. The new installation will be finished in about ten days. Two more 6-inch high pressure pumps have been installed so as to double the amount of water through the nozzle of the giant.

A night shift was started on December 30 for the Lidgerwood dragline, the two trains and the necessary track men.

The small Marion dragline is at work on the ground sluice to the new dredge pump location.

Two thousand feet of Road 13 has been completed.

An old barn, 30 feet by 50 feet near the bakeshop, has been remodeled for a garage and manual training room on the first floor and for an assembly hall on the second. Three fire stations and a number of coal houses have been constructed since last report.

O. N. Floyd, Division Engineer.

January 17, 1919.

HUFFMAN

Excavation for the outlet works has been progressing rapidly during the past month. All of the earth above bed rock, and the rock on the side of the excavation that had been previously drilled and blasted, have been removed. The dragline that is doing this work has been taken to the upper end of the cut, and is now digging downstream again finishing and cleaning up the excavation to grade. Drilling and blasting of the rock in this excavation is kept completed some distance ahead of the dragline.

A smaller clay cofferdam has been built along the river side slope of the excavation to protect the work from ordinary low water. This reduces the area to be unwatered, and thus cuts the cost of pumping to a minimum. The higher cofferdam, farther back, will be left to protect the work from high water and floods.

Preparations are being made to erect the derricks that will distribute the concrete in the outlet works. Work has begun on the building of forms and the placing of concrete is expected to commence early in the spring.

The gravel material that was excavated from the cut-off trench and piled in a windrow across the valley, as shown in the picture on the cover of the January Bulletin, is now being spread on the downstream third of the dam. A small

levee is being built along the downstream toe and the balance of the material is placed to form a gentle slope from this levee toward the center of the dam. This forms an excellent foundation to start the hydraulic fill when the dredge pumps are started.

C. C. Chambers, Division Engineer.

January 16, 1919.

DAYTON

The total material excavated from the river channel to date by the two large dragline machines is 248,000 cubic yards. Including the material moved more than once, a total of 373,000 cubic yards has been handled by these machines. The main channel improvement between Herman Avenue and Island Park Dam has been completed except finishing the levees, by dragline excavator No. 790, which moved 74,000 cubic yards of channel excavation and has handled a total of 112,000 cubic yards of material on this work. The machine has been moved over the street at the west end of Herman Avenue bridge and will now work southward from this point toward Main Street Bridge, excavating the right side of the main channel. Machine No. 789 is beginning to cut out Mad River channel from a point opposite the Gas Plant to Webster Street Bridge.

On Contract No. 41 the McWilliams Northern Dredging Company has placed 48,000 cubic yards of levee embankment with its dragline machine, and 2,700 cubic yards with teams.

About 67 feet of 12-inch water main were laid in the river channel above Herman Avenue during the past month, making a total of 417 feet laid at this point.

The steam tug has been completed except for the installation of the machinery.

C. A. Bock, Division Engineer.

January 16, 1919.

HAMILTON

The levee between the Columbia bridge and the Crawford's Run sewer outlet, a length of about 2000 feet, has been completed by the Class 14 Bucyrus dragline. This machine after being repaired, will move to the north end of the city and build the levees for the proposed hydraulic canal.

The Class 24 electric dragline is nearing the end of the track where it will begin loading material on dump cars to be hauled into the "spoil bank," or earth embankment which will be built to fill the low ground, several hundred feet in width, each side of South Avenue.

The two scows purchased from the Yawger Co. have been launched in a "pocket" in the river bank, excavated by the dragline.

The building on North Monument Avenue, formerly occupied by the Miami Welding Co., has been wrecked and is being re-erected in the storage yard south of South Avenue. It will be used to house the locomotives and cars when in need of repairs during inclement weather.

A small gang is proceeding with the removal of brick pavement and water mains from Black Street. The materials will be used in the new street.

The concrete sewer in Buckeye Street has been completed for a distance of 1030 feet. The excavation has reached Third Street. The Street Railway Co. has agreed to discontinue its car service on this street during working hours.

C. H. Eiffert, Division Engineer.

January 15, 1919.

RAILROAD RELOCATION

Erie and Big Four Railroad. The Walsh Construction Company excavated 31,000 cubic yards of material during the month of December from the big cut at Huffman Hill. They are now excavating about 1500 cubic yards per day with one steam shovel working 10 hours per day. The excavation of the Mad River channel change at Harries is being done by a small clamshell excavator. Condon and Kolterman, sub-contractors, are hauling steel rails preparatory to putting two steam shovels on the work east of Fairfield. The Bethlehem Steel Company are erecting 320 tons of structural steel for the underpass just west of the Huffman Dam. This bridge is the only one on the Erie and Big Four that will require a steel superstructure.

Mr. Sprague is working on the three concrete bridges near Enon and during the cold weather he is wrecking the old buildings on the right-of-way at Harshman. The water for Harshman's mill race has been diverted through the new concrete arch bridge at this point. The Springfield Pike east of Huffman Hill and south of Fairfield has been practically covered with gravel, and a large portion of it is ready for the final rolling and finishing. This will not be done before spring.

Baltimore and Ohio Railroad. The general contractors, Grant Smith and H. C. Kahl, and the sub-contractors, Condon & Smith, Vang Construction Co. and Kahl Bros. Construction Co. have five steam shovels in operation. All of the grading outfits were shut down for about two weeks during the holiday season, but have resumed work again except that of the Vang Construction Co. The 8-foot concrete arch at the Taylorsville Dam, which extends under the roadbed and the two railroad levees, is about 90 per cent completed. After this structure is finished, there will only be a small amount of concrete work, consisting of the head walls for the concrete and cast iron pipe culverts, remaining to be done on the B. and O. R. R. work.

Albert Larsen, Division Engineer.

January 16, 1919.

River and Weather Conditions

In general the river and weather conditions during the month of December were not unfavorable to construction progress. While the small freshet that occurred about the middle of the month caused some minor delays in the channel improvement work, no serious damage occurred. The temperatures were not low enough to seriously interfere with the concrete work at any time.

The total precipitation during the month, at the District's stations, varied from 2.71 inches at Pleasant Hill to 3.36 inches at Germantown. The normal amount for the Dayton U. S. Weather Bureau station for this month is 2.62 inches. The total number of days on which the precipitation exceeded .01 inch varied from 11 to 14 at the various stations. The maximum precipitation during a 24-hour period varied from 0.76 to 0.97 inches.

At the Dayton U. S. Weather Bureau station the average temperature for the month was 41.3° F., or 8.5° above normal, the lowest recorded being 20° on the 26th and the highest, 63° on the 13th. The maximum wind velocity for five minutes was 37 miles per hour, from the southwest on the 24th; and the average wind velocity was 11.3 miles per hour, the prevailing direction also being from the southwest. There were 6 clear days, 4 partly cloudy days, and 21 cloudy days.

Ivan E. Houk, District Forecaster.

January 15, 1919.

Honor to a Conservancy Engineer

A pleasing honor was conferred last June upon one of our designing engineers, and incidentally credit was reflected upon the work of the District, when Ross M. Riegel was awarded the Fuertes gold medal by Cornell University for his part in the investigation and publication of the action of the hydraulic jump described in Part III of the Technical Reports. The award is made annually to the Cornell alumnus who publishes the most important engineering paper during the preceding year.

Construction Notes

Improvements in Lockington Gravel Washer

Changes which have been made in the gravel washer at Lockington have improved it in several particulars. One of the difficulties early encountered was due to the fact that the sand, after being washed, carried too much water into the sand bin with it. The sand, mixed with considerable water, flows from the sand screen into a vertical hollow inverted cone, which it nearly fills. Most of the water overflows through a spout notched into the upper edge of the cone, while the sand is periodically discharged through a counter-weighted valve at the bottom. The discharged sand was still too wet. To remove this remaining water, the sand is now caught in an inclined cylindrical box in which works an Archimedean screw. The screw conveys the sand up the inclined cylinder, from the top of which it falls into the sand bin. The water drains down the incline as the sand ascends, and overflows through openings provided at the bottom. The device, which is simple and inexpensive, has proved effective in accomplishing the object desired.

The other improvements had to do with fitting the washer for better handling the particular gravel found at Lockington. The material contains few stones larger than the 1½-inch size. As a result, the two upper of the three screens (the 3-inch and 1½-inch sizes) have very little work to do in sorting out these larger stones, probably over 90 per cent of the material dropping through them into the ⅜-inch screen, which crowds the latter to such a degree that until the trouble was corrected much of the sand was unable to reach the holes and was carried over into the gravel bin. To correct this difficulty, baffles of angle-iron were bolted to the inner face of this screen, retarding the flow of gravel so that more of the sand could drop through. Also, additional water jets, directed from below into the mouth of the revolving screen, still further retard and scatter the contents, thus permitting the separation of the remaining sand.

As explained in an article in the January issue, the sand for use in concrete should be graded with reasonable uniformity from the fine to the coarsest, or ¼-inch size. At Lockington the sand which is available for use contains an excess of the larger sized grains. This makes it uneconomical, as it results in a "gritty" concrete that is very hard to work in the forms. To get rid of this excess, additional stationary screens have been set up underneath the ⅜-inch revolving screen. These are two in number and may be of either 4 or 5 wires to the inch. Two of them are set up slant-wise, like ordinary sand screens, side by side, the sand dropping upon them from the revolving cone. Two ¼-inch mesh screens, or two 1/5-inch mesh screens, may be thus used, or one of each, according to the run of gravel coming through the washer. These screens sort out considerable of the larger size, which is thrown away.

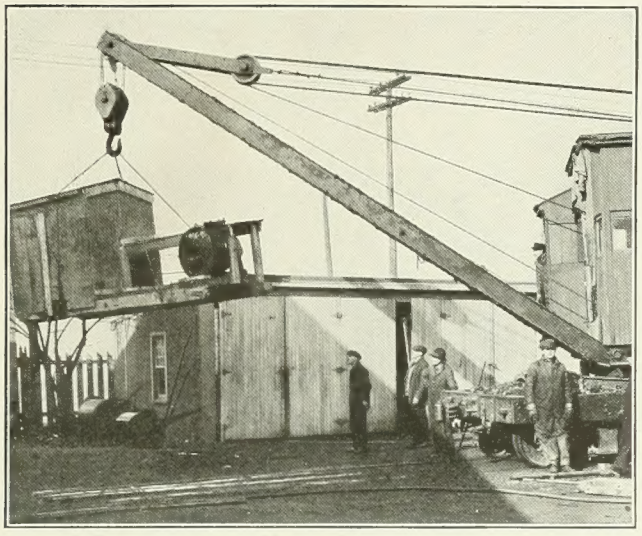
Some of the sand in the Lockington gravel is extremely fine, so fine that it is carried away with the water which flows from the lower end of the sand cone and is lost. This is, in effect, throwing away just so much cement, since these fine sand grains may properly take the place of cement in filling the voids between sand grains of larger size, as explained in the article referred to on concrete. To save this fine sand, the water that carries it is run into a settling tank, which permits the sand to drop to the bottom while the water runs away over a weir at the lower end. At intervals sand is shoveled from the bottom of this tank into the sand bin.

By thus getting rid of the excess sand of large grain and saving the fine sand, the amount of cement used in a batch of "lean" concrete at Lockington has been reduced from 6 bags to 5, a saving of 16-2/3 per cent in cost of cement. In the richer concrete the saving in cement is about proportional.

The result of this study in screening and grading the sand is saving the District more than $100 a day through the more economical use of cement which is made possible. The public generally does not realize the importance of the exactness and care which is being exercised in the design and construction of these works.

FIG. 98—STEAM TUG FOR LEVEE CONSTRUCTION, MIAMI RIVER

A steam tug of the Mississippi River type, built to "run in a heavy dew." She is 70 feet long, 20 feet beam, and 3 feet depth, with double engines with 8-inch by 42-inch cylinders, of about 100 horse power. Boiler carries 175 pounds pressure. The tug will draw nine or ten inches of water, and will push scows up and down the Miami River. The scows are 40 feet by 120 feet in size, and will carry the material excavated from the river bottom, to be deposited in the levees and spoil banks. Taken Dec. 24, 1918.



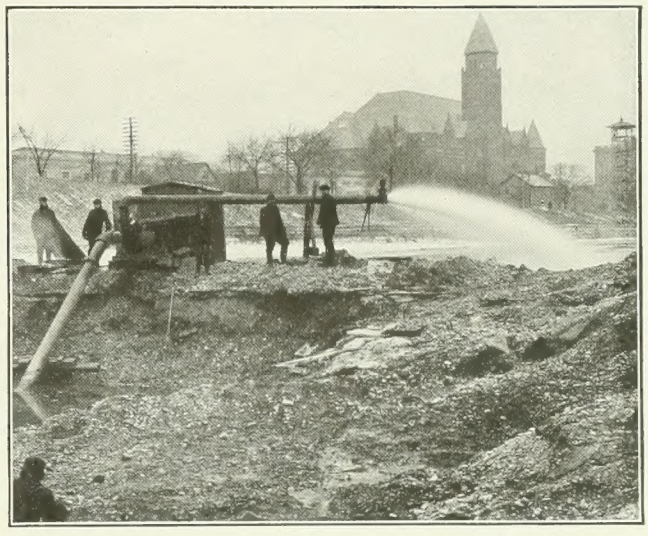


FIG. 99—PORTABLE PUMPING OUTFIT USED ON CONSERVANCY WORK

Shown at the right in action, at the left suspended from the boom of a derrick while being shifted from the Conservancy Shop to a motor truck which will transport it to the work. The little house is weather-proof, and contains the electric motor which is connected by a belt to the centrifugal pump mounted on the same platform outside. Electric power is used because available almost everywhere in the District on the Conservancy work. In action, the apparatus is shown taking water from the excavation at the left through the slanting suction pipe, and discharging it through the horizontal pipe above into the Miami River. The gate valve shown at the right-hand end of the discharge pipe serves two purposes. Shut tight at the end of a run, it maintains water in the horizontal pipe to prime the pump when it is next started. Partially shut, it can be adjusted to the rate of flow of the water which percolates into the excavation so that the pump can be kept steadily running while maintaining the water in the excavation at any level required by the exigencies of the work; otherwise, it would soon pump the excavation dry, after which it would pump air and require to be primed before it could again operate. For transportation the suction and discharge pipes are, of course, unscrewed. The pump is handily lifted by derrick or dragline to or from cars, motor trucks, or work. Right hand view taken Jan. 8, 1919; left hand view taken Jan. 20, 1919.

E. N. Floyd Goes to the Big Four

The Bulletin notes with especial regret the departure of E. N. Floyd, formerly in charge of the Conservancy railway relocation. Mr. Floyd will go to Cincinnati as the superintendent in charge of the new Fire Prevention Bureau of the Big Four Railway, under the immediate direction of the Chief Engineer of that railway, C. A. Paquette. He will supervise also the same work on the Cincinnati Northern, the D. T. & I., the Central Indiana, the Louisville & Jefferson Bridge Co., the Central Union Station at Cincinnati, and the Chesapeake & Ohio R. R. of Indiana. His work will be new and interesting. The annual fire loss on American railways is estimated at three hundred millions per year or twenty-seven dollars per mile. In view of this fact and of evident present neglect of it, the railway administration has ordered the roads to discontinue paying fire insurance and to organize fire protection for themselves in conformity with general plans adapted to all the railways of the country. This is the work which Mr. Floyd is going to take part in on the railways mentioned. It is a real job, and we wish him every success in tackling it.

Mr. Floyd joined the Conservancy forces in March, 1914, and since that time has been connected with various features of the work. Until recently, he has been in charge of the railway relocation in the Huffman and Taylorsville basins. He will go to his new work about February 1; his family will remain in Dayton probably until spring.

John W. Bolton Goes to North Carolina

John W. Bolton, Superintendent at Lockington, resigned December 19, to accept a position with the Southern Power Company at Bridgewater, North Carolina. For a number of years Mr. Bolton was connected with the Reinhardt-Dennie Company on the construction of the New York Subways. Later, for about a year, he was connected with the Hardway Construction Company on work for the Southern Power Company on the Catawba River near Bridgewater, North Carolina. There he was Superintendent on the Paddy Creek dam, a semi-hydraulic fill structure. This dam was the only one of the group completed according to schedule. Mr. Bolton's work at Lockington for the Conservancy comprised the construction of the gravel washing plant, the opening of the excavation for the concrete outlet structure, and the building of the foundations of the same, together with a very considerable section of the walls. He carried through this work with energy and ability, and it is with regret that his colleagues note his departure. We wish him success in his new field of labor.

The Camp Community Association idea, noted in our last issue, continues to find fertile soil. Englewood is organizing, following rather closely the simple scheme of organization of the city of Dayton.

FIG. 100—A BIG DRAGLINE CLIMBING OVER THE PIKE

This is a Class 175 Bucyrus machine, weighing about 175 tons. The boom is 135 feet long, enabling the machine, by swinging a half circle, to deposit material 170 feet or more from the point of excavation. The bucket will hold 3½ cubic yards—about 4 ordinary wagon loads—of earth. The boom reaches 80 feet above the track level, and the bucket will dig effectively 75 feet below that level.

The machine has just climbed an incline leading from the bed of the Miami river in Dayton to the west end of Herman Avenue bridge, 20 feet higher, building its own roadway and climbing by its own power. After crossing the avenue, it built another incline down to the river bed below the bridge, which it then descended. The crossing was done during the night shift, the street being closed to traffic only from 8 p. m. until 5 a. m.. The machine had just completed the channel excavation between Herman Avenue and Island Park dam, and instead of dismantling it and moving it under the bridge, the above better procedure was adopted. Taken Jan. 8, 1919.

FIG. 101—WHAT NOT TO DO WITH A HILLSIDE. (GERMANTOWN, JAN. 10, 1919.)

This shows what happens when the timber is cleared from a hillside. The gullies are due to wash by rains.